CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

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SECURITY INFORMATION

COUNTRY	USSR ([illegible])	REPORT	
SUBJECT	Electronics Activity and Development in the USSR	DATE DISTR.	[illegible]9 July 1953
		NO. OF PAGES	49
DATE OF INFO.		REQUIREMENT	
PLACE ACQUIRED		REFERENCES	

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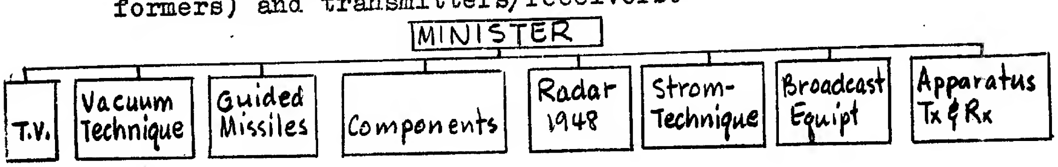
VACUUM TUBE DEVELOPMENT AND PRODUCTION IN THE USSR

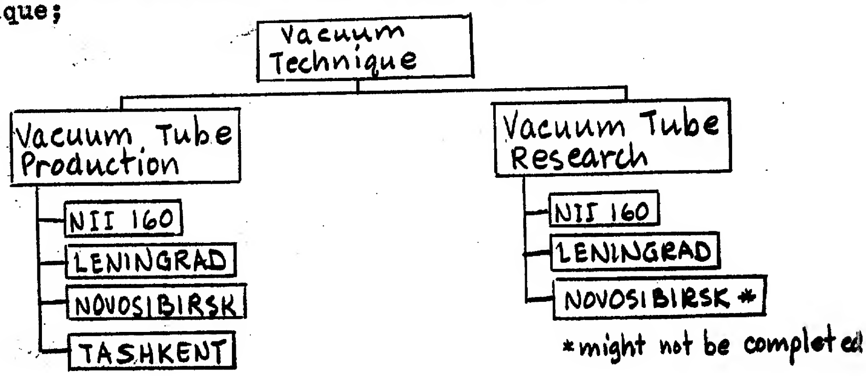
9. The USSR's vacuum tube research and production was administered by the Chief Directorate for Vacuum Technique, which in turn was under the Minister for vacuum technique, television, components, radar, guided missiles, broadcast radio equipment, strom-technique (motors, generators and large power transformers) and transmitters/receivers.[4]



10. The Chief Directorate for Vacuum Technique was headed by Ing. KATSMAN until 1948, at which time he was sent to Novosibirsk as technical director of the vacuum tube plant located there. KATSMAN was replaced by YELISAROV, who had worked very closely with the man in charge of the defense of Leningrad during World War II. (The defender of Leningrad died in 1949.) When YELISAROV took charge of vacuum technique many of the engineers at NII 160 were afraid of losing their jobs. In fact, ASTRIN was removed as chief of the Cathode Ray Tube Department and was replaced by SHUTAK. ZUZMANOVSKIY was replaced as scientific director of NII 160 by a Soviet named DEVYATKOV. Both ASTRIN and ZUZMANOVSKIY had worked and had trouble with YELISAROV when they were all together in Leningrad during the war. YELISAROV remained

chief of vacuum technique until 1950, at which time he was replaced by a young engineer who had been in charge of NII 160's cathode ray tube department. This young engineer remained chief until the first part of 1952, at which time SOROKIN, formerly of NII 160, became chief engineer of vacuum technique. [redacted] prior to 1948 the chief of vacuum technique was determined by technical ability and military influence. In 1948 the party took strong control and maintained it until 1950, when once again technical ability played an important part in determining who would be leader of the vacuum technique. 25X1

11. [redacted] vacuum tube plants [redacted] there were eight as of 1952. This belief is based upon a statement made by chief engineer SOROKIN when he left for the vacuum technique in February 1952. At this time he stated that he would then be in charge of eight vacuum tube plants rather than one. It is quite possible that all eight are not in production at the present time [redacted] The following is a chart of vacuum tube production and research factories assigned to the vacuum technique; 25X1 25X1



12. NII 160: [redacted] at Fryazino in 1946, there were approximately 300 Soviets employed at NII 160, of which 80 to 90 were engineers. These engineers were chiefly concerned with the development of radio-receiver type vacuum tubes and vacuum tube measuring instruments. The remaining 210 people were concerned with the actual production of vacuum tubes such as 6L6, 6H5, and 6AG7. [redacted] only 5,000 to 10,000 vacuum tubes were being produced monthly at NII 160 in the latter part of 1946. The production facilities 25X1 25X1

at NII 160 were steadily increased until approximately 500,000 tubes per month were being produced in 1952. The reject rate of vacuum tubes at NII 160 varied considerably, depending upon the type of tube being produced. [redacted] 25X1 at least 40 to 60 per cent rejects were experienced on all tubes produced. A 90 per cent rejection rate was being experienced on 6AK5 tubes in 1951. This rejection rate had several causes, the principal one being bad cathodes.

13. [redacted] NII 160 was responsible for the development of all Soviet magnetrons and klystrons and the production of all magnetrons. [redacted] other type vacuum tubes developed at NII 160 were produced at NII 160 as well as other plants. Soviet engineers told [redacted] on various occasions that NII 160 was the USSR's main vacuum tube development plant. This statement was somewhat substantiated by the fact that newly graduated Soviet engineers desired to be assigned to NII 160. The importance of NII 160 was also reflected in the fact that it was planned that the number of NII 160 workers be doubled within the next two years. This planned expansion was in addition to the 1949 - 1952 expansion, which was to offset the return of the Germans. 25X1 25X1 25X1 25X1 25X1

14. **LENINGRAD:** [redacted] two German engineers were assigned to or visited this factory. [redacted] one engineer, presently at OSW, was assigned to Leningrad from NII 160. [redacted] his name was BEHLKE and that he returned to Germany in 1950. Horst GERLACH, a German engineer, spent two weeks at the Leningrad tube plant in either 1947 or 1948. In 1949 the tube plant in Leningrad sent approximately 100 x 723 a/b type klystrons to NII 160 every month. These tubes were sent to NII 160 so they could be tested prior to being delivered. [redacted] these 100 per month constituted the entire output of klystrons at Leningrad. After 1949 NII 160 continued to receive approximately 50 to 60 klystrons per month for testing; however, they were not the entire output of Leningrad, since NII 160 had sent klystron testing equipment in 1949. This indicates that the plant in Leningrad started testing some of its own klystrons in 1949. [redacted] The klystrons that were sent to NII 160 were of good quality. 25X1 25X1 25X1 25X1 25X1

15. As for tube development at Leningrad [redacted] some developmental work might possibly have been done on klystrons, but the developmental facilities there were not so large as those at either NII 160 or Novosibirsk. 25X1 25X1

16. NOVOSIBIRSK: At Novosibirsk all of the general types of vacuum tubes were manufactured during World War II. ZUZMANOVSKIY told [redacted] that most of the Soviet engineers at NII 160 were sent to Novosibirsk approximately six months after Leningrad was attacked. [redacted] the Novosibirsk plant was approximately equal to NII 160 insofar as production was concerned, and was trying to equal NII 160 in tube development. This opinion is based on the fact that Dr. Karl RICHTER was sent to Novosibirsk for five weeks in November or December 1949. Upon his return [redacted] there were approximately 3,000 employees at Novosibirsk and [redacted] they were developing and manufacturing metal ceramic tubes as well as general types such as 6AC7 and 6AG7. Dr. RICHTER was sent to Novosibirsk to straighten out production problems hampering the manufacture of metal ceramic tubes LD 9, LD 10, LD 11, and LD 12. [redacted] Novosibirsk was the only Soviet factory which manufactured metal ceramic tubes, and some of these tubes were used in the microwave sets made at NII 180. The metal ceramic tubes made at Novosibirsk were of better quality than those made in Germany, but there were many rejects when Dr. RICHTER was there. [redacted] there was a great expansion at Novosibirsk in 1952, and estimate that approximately 5,000 were employed there. [redacted] 25X1 25X1 25X1 25X1 25X1 25X1 25X1

17. As for development, [redacted] Novosibirsk is probably second only to NII 160 [redacted] they have a small vacuum tube development cell that can be enlarged if necessary. [redacted] the metal ceramic tubes developed and produced at Novosibirsk were superior to those being made at OSW, and that Novosibirsk was responsible for the production and development of all Soviet metal ceramic tubes. 25X1 25X1 25X1

18. TASHKENT: This vacuum tube plant was the smallest of the four, and was concerned with the manufacture of vacuum tubes that were very easy to make. [redacted] this plant was always having labor problems, and could never get good Soviet engineers to come there. It was very cold in the winter, hot in the summer, and was plagued 25X1

with sand storms. Since no experienced personnel was available, the tube plant was forced to employ former cotton field workers, and, therefore, only the most simple type tubes could be produced.

19. [redacted] 25X1 recommended that the American octal-base tubes be copied in the beginning and that they be replaced by miniature type tubes as soon as possible. This recommendation was based on the fact that the 6J6 was the only miniature tube that could be made in the USSR at the time [redacted] The dies, tools, and equipment for mass-producing this tube had been made at OSW, and brought to NII 160; therefore, this tube started being mass-produced in 1947. [redacted] 25X1 It was further recommended that the magnetrons and klystrons be copies of similar American tubes.

20. Actual JAN specifications were used for vacuum tubes until 1949 or 1950, at which time copies of these specifications were published in Russian, and these copies were used. There were also copies of the specifications in English; however, these were classified and were never used unless the Russian specifications were outrageous due to poor copying. Whenever this happened, the English language specifications were always used. The Soviets never improved on any of the American characteristics. In fact no close tolerances were maintained by the Soviets, since the Americans did not list them.

21. Subminiature tubes were not considered in [redacted] 25X1 recommendations to KATSMAN. [redacted]

22. The following is a 1950 price list of vacuum tubes produced at NII 160 and indicates the amount of money

25X1

credited to the institute when the tubes were delivered to another institute or ministry:

Vacuum Tubes[6] Produced at NII 160	Price in Rubles
6B8	24
6L6 (6П3)	16
6V6	18
6AC7	22
6AG7	?
6SJ7 (6Ж7)	12
6SH7	?
6H8 (6SN7)	17
6H9 (6SL7)	17
6H7	17
6 X 5	11 - 12
5 Z 4	11
5 U 4	12
6E5 (Magic Eye)	14
6H6	14
6A8 (Pentagrid Converter)	16
6A10 (6SA7)	16
224D	22
6Г7 (?) (6Q8)	16
6 J 5	?
6 F 6	16
K 2/40 klystron	180 (First were built exactly like the American Octal-Base tube. In 1950 made with miniature bases.)
KD 2 or KD 3 (Crystal Rectifiers)	20 - 50 depending upon quality; 50 rubles for one with less than 6DB conversion loss and noise factor less than 3.

23. [redacted] 25X1

Prior to 1950 the 6AC7 and 6AG7 vacuum tubes were gladly received by the Soviets due to the fact that these OSW manufactured tubes had a higher transconductance than did either the Soviet or American made tubes. After 1950 the East German tubes lost much of their former prestige due to their short life. [redacted] 25X1

[redacted] 25X1

[redacted] this short life was caused by poor cathodes; however, the Soviets still thought the German tubes were satisfactory. The metal ceramic tubes made at OSW were not as good as those made at Novosibirsk. The ones made at OSW in 1946 were much better than those made there from 1948 on. [redacted] this is due to the fact that OSW's metal ceramic specialist, MAGNER, went to Philips Eindhoven in 1947. [redacted] first saw a metal ceramic tube made by Novosibirsk in 1948, and considered it to be a good quality. 25X1 25X1 25X1

German-made vacuum tubes were always available [redacted] at NII 160. Some of them were of 1944-46 vintage, but many were postwar. A transmitter tube originally used in the pulse-time modulated equipment at NII 180 was the metal ceramic tube LD10. This tube was later replaced with a klystron. 25X1

DECIMETER EQUIPMENT

24. [redacted] the Soviet-ordered "Decimeter Equipment" program from its inception through the equipment development, testing, and utilization stages [redacted] The Stuttgart equipment was first worked on by the Lorenz plant, now known as Sachsenwerk Radeberg, while the Rudolf was developed and produced by Telefunken (now OSW). 25X1

a. This equipment was ordered to be developed by the Soviet Post Ministry in 1946. 7 It was still being developed and used for commercial communications.

b. [redacted] Mytishchi received part of the equipment, since it was one of the Administration of the Post Ministry's laboratories. 25X1

c. [redacted] the Michael equipment was captured at Floeha and sent to the USSR in 1945. One piece was installed on the roof of the old silk factory building [redacted] at NII 160 in 1946. It was used as a substitute for telephone communications with the Ministry in Moscow. 25X1 25X1

[redacted] 25X1

d. The time-phase modulation equipment, worked on at OSW by GRIMM and FOGY in 1945, utilized an electronic CRT switch and was later worked on at Mytishchi. This work was in competition with similar work done at NII 180 in Moscow.

e. The time-phase modulation equipment, worked on at OSW, in 1946, utilizing 6SH7 tubes as switch tubes was worked on by FOGY, GRIMM, [redacted] at NII 160. 25X1

f. The time-phase modulation equipment, worked on at OSW in 1946, utilizing 6SN7 tubes as switch tubes, was later a responsibility of, and worked on by, engineers of NII 180. The men at NII 160 were consultants to this institute.

The actual beginning of pulse-phase modulation equipment was an order received by OSW in the latter part of 1945. This order came from the Soviet military and required that the original equipment have 12 channels, and be capable of being expanded to 24 channels. This equipment was never developed far enough to be assigned a military code name (such as Stuttgart, Rudolph, etc.). The job was assigned to Dr. ROOSENSTEIN and four or five German engineers. Dr. ROOSENSTEIN worked in the Theoretical Department of NII 160, and is presently with the East German Post Ministry. Dr. ROOSENSTEIN was an ardent Communist, and could not be trusted. [redacted] 25X1

A 12-channel laboratory model had been completed by Dr. ROOSENSTEIN when the war ended in 1945. It operated on a wavelength of 50 to 60 cm. and had an output of one watt. The RF section was identical to that of the Michael equipment. Also, at this time the Dr. ROOSENSTEIN group had about completed the development of the 24-channel pulse-phase modulated equipment which utilized an electronic switch tube rather than 24 separate tubes. There was much discussion among OSW personnel as to whether 24 6SN7 tubes should be used rather than the 24 contact electronic switch tube. The final decision was to use 24 6SN7 tubes even though the laboratory model of the 24 contact switch tube had just been completed at OSW.

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[redacted] 25X1

In 1945 KAKUNIEN, a Soviet colonel, and SIEVERT, a Soviet major, both from the USSR Postal Ministry, came to OSW and took the pulse-phase modulated equipment with them when they returned to the USSR. Both men wore [redacted] the uniform of the Soviet Air Force. [redacted] the equipment was taken [redacted] to Mytishchi. 25X1

[redacted]

In the last month of 1946 and the first few months of 1947 a series of conferences were held at NII 160. These conferences all concerned the decision as to which type of decimeter equipment was to be made in the USSR. The following people were in attendance at these conferences:

From NII 160 - ZUZMANOVSKIY (then Scienfific Director)
[redacted] (attended all meetings) 25X1
Dr. STEIMEL (attended part of the meetings)

From NII 180 - Dr. LIPPSMAN ?
Chief Engineer [redacted] 25X1
Technical Director [redacted]

From Mytishchi - Major SIEVERT
Chief Engineer [redacted]

From Post Ministry - Two engineers

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[redacted] 25X1

From Vacuum Technique - Engineer KATZMAN. He also started attending in the beginning of 1947.

On the basis of these conferences, which lasted until June 1947, it was decided that both NII 180 and Mytishchi were to develop decimeter equipment. The laboratory model for NII 180 was to be made at NII 160 and was to have 12 channels. [redacted] the exact wavelength [redacted] was suggested [redacted] be in the 12-cm. region [redacted] later changed [redacted] to 16cm. so metal ceramic tubes could be used, since they were the only tubes available for use at this time. It was further decided that the equipment for the Post Ministry would be developed at Mytishchi, would have a wavelength of 18 to 20 cm., 12 channels, and would utilize the 12-position electronic switch tube. Both models were to be completed within a period of one year, which meant that the laboratory models would be ready by June 1948. The pre-development at NII 160 was to be carried out completely by German scientists headed by Dr. FOGY and with Dr. ROOSENSTEIN [redacted] 25X1 [redacted] Dr. FOGY was assisted by GRIMM 25X1 and KLUGE. The laboratory model was completed at NII 160 on schedule in either June or July 1948. As soon as it was completed, LIPPSMAN of NII 180 took the model to his institute. Near the end of 1948 LIPPSMAN told [redacted] that he would have to work quickly 25X1 in order to get ahead of the Post Ministry Group at Mytishchi. From mid-1948 until mid-1949 there were consultations at NII 180 once or twice each week. FOGY, GRIMM, [redacted] were the [redacted] consultants 25X1 from NII 160. LIPPSMAN wanted these consultations twice a week, but NII 160 would not agree to [redacted] more than once each week. In mid-1949 the [redacted] consultations suddenly ceased. [redacted] this was a result of differences between NII 160 and NII 180. LIPPSMAN came to NII 160 a few times after this to discuss small problems, and to pay [redacted] 25X1 [redacted] consultant services. All [redacted] received the same amount for consultant 25X1 fees - 5000 rubles were left after 1000 had been deducted for taxes. As of mid-1949 the basic work was completed on the production model, but some smoothing up was still required. No production had started at this time. The equipment at this time operated on a wavelength of 15.5 to 16.5 cm., had a 10-watt output, 12 channels, approximately a total of 80 tubes in the transmitter and receiver, and used a parabolic antenna which was three meters in diameter. In December 1949 or January 1950, LIPPSMAN received the Stalin Prize for having developed the equipment described above. [redacted] 25X1

[redacted] 25X1

 [redacted] 25X1

[redacted] LIPPSMAN also finished the development of another communication device, very similar to the one described above, except it used a parabolic antenna that was 60 to 80 cm. in diameter. This gear was to be used as a portable piece of communications equipment. 25X1

[redacted] all of the above equipment will be used both by the military and the Post Ministry; however, the military would be the agency primarily concerned with this equipment. [redacted] 25X1 25X1

The Soviets succeeded in capturing great quantities of the Michael equipment in 1945--from the German plants A.E.G. and Telefunken, as well as from the testing station Floeha which was located in Saxony. [redacted] the Soviets captured, and sent to the USSR, at least 120 new Michaels from the Floeha station. [redacted] this equipment was manufactured in Germany as late as 1947. [redacted] one Michael was installed on the roof of the old silk manufacturing building at NII 160 in 1946. [redacted] a similar piece of equipment was installed at NII 160 (Ministry in charge), since a Soviet engineer told [redacted] that the equipment at NII 160 was used as a substitute telephone link between the institute and its Ministry. [redacted] at least three Michael antennas installed on an airfield between Monino and Moscow. Each was pointing in a different direction, and they were probably used for communications between airfields. [redacted] 25X1 25X1 25X1 25X1

25. Q. Explain GRIMM's assignment at NII 160 [redacted]

 [redacted] 25X1

[redacted] His assignments at NII 160 and OSW were practically the same. GRIMM worked as a consultant to FOGY during their stay at NII 160, while FOGY had worked as GRIMM's assistant at OSW. The main work on the pulse-phase system was done by FOGY except for the actual pulse techniques, which he did not know about. All of the laboratory models were made by FOGY and the three or four Soviet engineers that worked for him at NII 160. These engineers were assigned to LIPPSMAN's laboratory in Moscow and were very capable engineers. [redacted] FOGY was placed in charge 25X1
of GRIMM's work due to the fact that FOGY was one of the most competent German engineers at NII 160. Prior to his coming to the USSR he had worked on the old German Euclid system. FOGY was concerned with a larger field than was GRIMM, inasmuch as FOGY worked on many centimetric problems while GRIMM was principally 25X1
concerned only with pulse.

26. [redacted]

27.

28. [redacted] the development of the pulse-phase modulated communications device [redacted] 25X1

KLUGE worked on a 12-contact electronic switch at OSW immediately prior to his deportation to NII 160. He had actually produced one of the tubes while at OSW, but it never did work properly. He continued this work at NII 160 and served as a consultant to Major SIEVERT's group. [redacted] the main task 25X1
of KLUGE, as a consultant for SIEVERT, was perfecting this electronic switch tube. Work on this tube stopped in 1949 as a result of KLUGE's recommendation that the entire project be discontinued due to the fact that it was seemingly impossible to make such tubes work properly. [redacted] KLUGE was not 25X1
concerned with any problems of Major SIEVERT after 1949, but [redacted] not convinced that the Soviets stopped 25X1
all work concerning 12- and 14-contact switch tubes. [redacted] these tubes were made at a place other 25X1
than NII 160.

 [redacted] 25X1

MAGNETRON DEVELOPMENT

29. [redacted] 25X1

Originally there was only one magnetron development department at NII 160. This department was headed by ZUZMANOVSKIY, after he was relieved of his job as technical director of NII 160, and was concerned with CW magnetron development. In 1950 this department was taken over by SHAKOV with ZUZMANOVSKIY remaining as a consultant. This CW Magnetron Department was originally located on the first floor of the old institute building and had at least four Soviet engineers, five Soviet technicians, 20 Soviet mechanics, four German engineers, two German mechanics, and a German glass blower. All Germans were removed from this department in the latter months of 1950 when the department was transferred to a new two-story building that was 20 meters long and 8 to 10 meters wide. [redacted] 25X1 however, all of the equipment previously located in the laboratory of SHAKOV was moved into the new building. The new building gave the CW magnetron group approximately twice as much space since it was the only group in the new building. [redacted] 25X1 [redacted] not know of any additional NII 160 25X1 engineers that were transferred to this new building; however, many new ones came to NII 160 from Moscow at this time, so [redacted] 25X1 [redacted] some were put in this new 25X1 building.

As for the work done by the CW magnetron group, [redacted] ZUZMANOVSKIY had 25X1 successfully completed a 50-watt, three-centimeter, and a 100-watt, 10-cm., CW magnetron as of 1948. Later he completed the development of a 300-watt, three-centimeter, and an 800-watt, 10-cm., magnetron. [redacted] 25X1 these magnetrons were to be used for noise-modulated jamming and were built for Admiral BERG's radar institute. [redacted] representatives 25X1 of BERG's institute went into the CW magnetron laboratory very often and consisted of men in Navy and Air Force uniforms. [redacted] 25X1 BERG, SHOKENIN and Prof. SHCHUKIN of

 [redacted] 25X1

the Navy, and Gen. UGIR of the Air Force visited the NII 160 CW magnetron department. [redacted] no idea as to the type of projects they were interested in, but assume that it was for CW noise-modulated jammers. [redacted] ZUZMANOVSKIY had developed a tuneable 10-cm. magnetron, capable of being tuned over a range of 2700 to 3300 megacycles (approximately ± 8 per cent). This 300-watt magnetron was completed in 1948. 25X1 25X1

[redacted] all CW magnetron work in the USSR was done at NII 160. This belief is based on the fact that ZUZMANOVSKIY was the most capable Soviet scientist at NII 160, and that the CW magnetron department was given the entire new building in 1950. ZUZMANOVSKIY was demoted because he was not a Communist; however, he [redacted] he actually welcomed being relieved as chief of the CW magnetron department, and being assigned as a consultant to the department. He stated that his pay remained the same and that he was not always being pressed to carry out orders. ZUZMANOVSKIY was very good at developing his own ideas, and did not copy American magnetrons. He studied at the Technische Hochschule, Berlin [redacted] 25X1 25X1 25X1

Some work on traveling-wave tubes was carried on in this laboratory. [redacted] a Soviet engineer asked [redacted] about noise figures for traveling wave tubes in 1950. [redacted] 25X1 25X1

The NII 160 work on pulse magnetrons was carried on under the direction of FEDOSEYEV. FEDOSEYEV was very capable in copying American tubes, and was always able to meet any production deadline. The Pulse Magnetron Department was the best equipped NII 160 department in 1947, and occupied approximately 300 square meters on the second floor of the main institute building until 1950, when it was assigned an additional 80 square meter area on the first floor of the main institute building. This Department consisted of four laboratories and a workshop.

The Magnetron Development Laboratory of the Pulse Magnetron Department was headed by FEDOSEYEV, who was also the department chief. There were three well-qualified Soviet engineers and seven student technicians assigned to this laboratory. Fritz SIEMS (presently at OSW in East Berlin), a German engineer, worked on test sets for FEDOSEYEV until the year 1950. All of the work done in this department consisted of copying American magnetrons with the exception of work done on a 10-cm., 1,000-KW., tuneable pulse

 [redacted] 25X1

magnetron. Supposedly this tube was to be tuneable over a ± 8 per cent range and was to be used for jamming purposes. There were plans for extending the power to 10 megawatts [redacted] 25X1 FEDOSEYEV copied the three-centimeter and 10-cm. magnetrons, but not in any great quantities. [redacted] only 25X1 90 to 100 x10 cm.-magnetrons were made monthly at NII 160 as of 1951. This belief is based on the number of copper cavities produced in the machine shop located on the ground floor of the main institute building. [redacted] 25X1 If this number of magnetrons is not great enough to supply the Soviet needs, then [redacted] 25X1 pulse magnetrons are being made other than at NII 160.

The Pulse-Modulation Laboratory of FEDOSEYEV'S department was headed by STROGANOV and two Soviet engineers plus an unknown number of Soviet student technicians. [redacted] 25X1 In 1947 [redacted] STROGANOV was working on a spark-gap modulator. [redacted] this 25X1 modulator was designed to be used with a 1,000-KW, 3,000-megacycle magnetron. This 25X1 modulator was still being worked on in 1949. [redacted] 25X1

The Gas-Discharge Tube Laboratory was headed by Miss VOGELSON [redacted] 25X1 In her laboratory work she was aided by two Soviet engineers, and an unknown number of Soviet student technicians. No Germans worked in this laboratory. [redacted] she copied a gas 25X1 discharge tube of the Rotterdam radar set as well as RCA triode and tetrode thyratrons. She also developed a larger thyratron [redacted] 25X1

The Transmitter Tube Laboratory was manned by Mrs. KRAKAU, a Soviet engineer, three other Soviet engineers (two were women), and an unknown number of Soviet technicians. German engineer HAUCKE worked on UKW (ultra-high-frequency) tubes in this laboratory until 1950. A 300-watt triode (for frequency modulated transmitter operating on a two-meter wavelength), a 350-watt tetrode for two to three meters, and a 1,000-watt triode for two to three meters were developed by this laboratory. The workshop was manned by 12 Soviet and two German mechanics who were transferred in 1950.

 [redacted] 25X1

In general, [redacted] sum up the work of FEDOSEYEV's 25X1
Pulse Magnetron Department by saying that, when America developes a new magnetron, this department will copy it as soon as the information is available. However, [redacted] not know of any Amer- 25X1
ican 1.5 cm.- or .8 cm.- magnetron development 25X1
which corresponds to the crystal detector work done at NII 160.

30. [redacted] NII 160 [redacted] two magnetron departments [redacted]

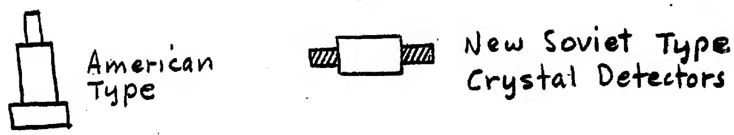
Originally they wanted only one with ZUZMANOVSKIY 25X1
in charge; however, he and FEDOSEYEV could not get along, so it was decided to have two different departments. ZUZMANOVSKIY was a very capable engineer and had very good ideas, but he was very slow, and never stopped improving what he invented. FEDOSEYEV was incapable of inventing anything; however, he was very capable in copying American magnetrons. He had an excellent repu-
tation at the Ministry because he always ful- 25X1
filled the quota and delivered the magnetrons on time.

31. Where [redacted] most Russian magnetrons manufactured [redacted] 25X1

In the beginning all magnetrons were manufactured at NII 160; however, it is quite possible that 25X1
some pulse magnetrons are now made at another place. This belief is based on the fact that only 90 to 100 copper blocks per month were made for 10-cm. magnetrons. [redacted] all CW 25X1
magnetron work was done at NII 160 since ZUZMANOVSKIY was such a capable engineer. [redacted]

32. [redacted] type vacuum tubes are used in Soviet manufactured radar sets [redacted] one of the first series of the Soviet modern radars utilized a direct copy of American 10 cm.-magnetrons. Later series perhaps used a 1000 KW output-magnetron. This same radar utilized a copy of the American 10 cm.-glass klystron 2K45, and will probably be used for ground warning and antiaircraft purposes. The TR and RT boxes will also be exact copies of the American tubes; however, the crystal detectors will be somewhat different from the American ones. The electrical characteristics will be similar, but the latest crystals will have a different physical shape.

[redacted] 25X1



The three centimeter 30-KW pulse magnetrons will probably be used in airborne equipment just as the Americans did in the last war. The Germans copied the American bombing radar during the last of the war, and the USSR asked OSW to work on this problem for them in 1946, so they probably will continue to use this 30-KW magnetron in the modified "Meddo" equipment. The three centimeter klystron will be a copy of the 726-A/B metal klystron. Again the TR and RT boxes will be copies of similar American tubes.

[redacted]

33. It has been stated that a major Soviet effort is being made to develop wide band search receivers in the range of 2500 to 3300 megacycles. [redacted] 25X1

[redacted] there was a requirement at NII 160 for the developing of a magnetron tuneable from 2700 to 3300 megacycles [redacted] do not believe that the Soviets could get a frequency variation greater than 10 cm. ± 8 percent in their 1948 magnetrons, but it is possible that they can obtain the 2500 to 3300 megacycle tuneable spread today. ZUZMANOVSKIY's department was responsible for developing tuneable CW magnetrons; however, his department was declared secret in 1948, and German engineers could not enter it after this time. [redacted] he continued to develop tuneable magnetrons [redacted] 25X1

ZUZMANOVSKIY'S department had developed a 10 cm., 100 to 300 W, membrane-tuned CW magnetron capable of being tuned over 10 cm. ± 8 per cent in 1948.

[redacted] their maximum effort on jamming equipment was for the 10-cm. region; however, 25X1

 [redacted] 25X1

some was done on three centimeters. It was originally planned to make some jamming equipment for the region between three centimeters and 10 cm., but only 10-cm. and three-centimeter equipment was being used in 1952. [redacted] 25X1

This test equipment was not in use in 1952 even though it was completed in 1950.

Considerable emphasis was placed on the two-centimeter and eight-millimeter wave lengths. Test lines were made for these frequencies; however, no magnetrons or klystrons were made for this frequency region. One 2000-volt klystron at NII 160 could be used for eight millimeters. It had been made at a laboratory located in Moscow and arrived at NII 160 in 1950. It was used in a testing generator designed to test eight millimeter crystal rectifiers.

34. [redacted] Soviet Work done on wide band amplifiers. 25X1

There was no wide band laboratory as such at NII 160, but this work was carried on in the Klystron Department. [redacted] Three amplifiers were to be constructed for each of the three frequencies. The Soviets placed great importance on [redacted] obtaining an excellent noise figure for these amplifiers, and at first required that it have an amplification factor of 300,000; however, this was later reduced to 100,000. At first [redacted] cascaded 12 6AC7 tubes, but later on [redacted] cascaded 12 6AK5 tubes. [redacted] it would be very difficult for the Soviets to build these amplifiers in some other laboratory. This difficulty would result from the fact that the original amplifiers were constructed of non-standard parts due to the fact that NII 160 did not receive any standard Soviet parts until 1950. After 1950 the Soviet components were of good quality and were standardized. 25X1 25X1 25X1

 [redacted] 25X1

In 1951 [redacted] given the task of constructing a wide-band amplifier for the frequency range of 20 KC to 70 megacycles. It was to be used as a video amplifier and was to employ 6AK5 tubes. [redacted] one of these amplifiers in 1951 and was supposed to make a second one; however, it was not completed [redacted] Only two of these amplifiers were to be made. 25X1

At the beginning of 1952, [redacted] asked to make an amplifier capable of handling a 10-KC to 150-megacycle range. [redacted] The amplifier was to use 6AK5 tubes as chain amplifiers. The Soviets were interested in developing a wide band oscilloscope which would be capable of working at 50 cycles. The coupling problem and large condensers gave so much trouble that they assigned [redacted] the job of determining a better method of coupling which would eliminate these troubles. [redacted] 25X1

The Soviets were very anxious to get a 100 V output from a 150-megacycle wide-band amplifier. [redacted] they obtained a 100-V output over a 50-megacycle band width amplifier in 1952 by using LV3 tubes as chain amplifiers. EIKEN, a Soviet engineer, was to continue this work [redacted] The Soviets also assigned OSW the job of designing an oscillograph with a 100-V output, wide-band amplifier, capable of handling a frequency range of 30 cycles to 50 megacycles. This was probably finished in 1952 in an OSW laboratory headed by engineer VOSS. 25X1

35. [redacted] the operation of various jamming stations, location of control stations, jamming techniques with special emphasis on the development of jamming equipment for airborne use.

In 1947 Dr. STEIMEL [redacted] assigned to set up a program for tuneable-magnetron development at NII 160. In 1947 a 10-cm. tuneable-pulse magnetron was to be developed. The first 10-cm. tube was to have an output of one megawatt, which was to be extended to 10 megawatts at some future date. Development of the three-centimeter tuneable pulse magnetron was to start in 1948, with the first tube to have an output of 3000 KW, which could later be extended to one 25X1

[redacted] 25X1

megawatt. FEDOSEEV was responsible for this development and in 1947 had eight Soviet engineers and approximately 20 Soviet technicians to help him. He was very competent in copying American magnetrons.

KUZMANOVSKIY was responsible for designing a three-centimeter, 300-watt, and a 10-cm., 800-watt magnetron for noise-modulated jamming. In 1947 and 1948 he had succeeded in making a 50-W, three-centimeter, and 100-W, 10-cm. magnetron.

The Soviets did not use noise-modulation techniques on their jamming of broadcast stations; however, they wanted to use this type of jamming for the radar field. [redacted] 25X1

[redacted] 25X1 Admiral BERG's Institute was interested in Marine and Air Force problems, and its representatives always wore one of the uniforms of the Navy or Air Force. The Navy representatives were BERG, SHOKENIN, and Prof. SHCHUKIN, while the Air Force representative was Gen. UGIR.)

The USSR attempted to jam any foreign station that had propaganda broadcasts. Both RIAS (Radio in the American Sector) and BBC (British Broadcasting Corporation) were jammed by a transmitter located near Moscow. In the Fryazino area it was practically impossible to receive these stations, even though they were not being jammed, as a result of the disturbances caused by NII 160 equipment, especially those caused by the induction heaters of the NII 160 vacuum tube plant. [redacted] 25X1 Another factor causing certain programs not to be heard is the cutting off of Fryazino electrical power during certain parts of the day. This power curtailment was necessary in order that

 [redacted] 25X1

NII 160 would have an ample supply. The power was cut off for certain sections of Fryazino during different periods. [redacted]

36. [redacted] 25X1

The three-centimeter silicon detectors made by SCHLOEMILCH were used in radar sets that had a maximum output of 300 KW. The 10 cm.-crystal detectors were used in radar sets which had a maximum output of 1000 KW. The eight-millimeter crystals were said to be designed for use in airborne radar equipment [redacted]. 25X1

Germanium detectors were being developed at some institute other than NII 160. [redacted] 25X1 Work on germanium transistors was carried on in KRASILOV'S laboratory at NII 160. When the first American papers on transistors were published in 1949, KRASILOV told [redacted] to study the literature and 25X1 advise him as to the importance of transistors. [redacted] he prepared a paper stating 25X1 that the USSR should make transistors.

Three months after he sent the letter to the ministry, he was assigned the job by a special permit from the ministry. [redacted] 25X1 In 1952, KRASILOV told [redacted] that they were making only the point-contact type transistors. There were two or three students and one engineer working on the development of transistors at NII 160 as of 1952. The students worked eight hours per day at NII 160, but received one work-day off each week to attend classes at the University of Moscow. This work was a prerequisite for their first diploma. It is possible that HELLWIG, a [redacted] German engineer 25X1 presently at OSW (East Berlin), knows more about transistor development at NII 160.

37. [redacted] the reason for FOGY's arrest [redacted] 25X1

Dr. FOGY was perhaps the youngest and the most competent (technically) German deported to the USSR in 1946. He had many of the weaknesses of a genius and was like a boy in

 [redacted] 25X1

political matters. He was definitely anti-Communistic, but, once he believed a political idea, he would never give it up. He paid many visits to the Austrian Consul in Moscow. This practice was not forbidden, but was frowned upon by the Soviets. [redacted] Many of the Germans visited the Austrian Embassy, and were not arrested for doing so. [redacted] RIEDEL also visited there, as did EITZENBERGER, who worked with BUSCHBECK's group. Dr. FOGY personally took a letter written by Dr. STEIMEL to the Austrian Consul near the end of 1947. STEIMEL originally wanted to turn it over to the American Embassy, and went to Moscow on two different occasions to do so, but each time he became afraid. Later, FOGY told [redacted] that STEIMEL had asked him to deliver the letter to the American Embassy, [redacted] Later on FOGY took the letter to the Austrian Consul. [redacted] letter contained a complaint about the Germans being forcibly taken to the USSR. [redacted] FOGY is presently working in his speciality somewhere in the USSR. In 1950, immediately prior to her returning to Germany, FOGY's wife received 500 rubles from FOGY. Prior to this, in May 1950, she had received a letter from FOGY stating that events were going better for him, his hair had grown out again, and he was gaining weight. He was earning a small amount of money - not much, but he would send her money to support her. He also said he was playing the accordion once again. Moscow postmarks were on both the letter and the money order [redacted]

25X1

38. [redacted] FOGY work prior to his arrest [redacted]

FOGY was concerned with microwave measuring technique for the Soviets and worked in the NII 160 Department for Radio Technique until his arrest in February 1949. At this time he worked for DURASOV, who was his laboratory chief, and who was under the direction of department chief STRUTINSKIY. FOGY dealt with waveguide problems, concentric lines, Magic T's, and hollow-cavity technique. One of the important things he did

[redacted] 25X1

was to standardize the cross sections of waveguides for all of the USSR. He followed the American type of waveguide and recommended that only rectangular waveguides be used. Practically all of FOGY's work was the actual copying of test instruments described in Montgomery's radar book (Radiation Series No. 8). FOGY actually established the Soviets in this field and after a period of approximately 1 ½ years he had succeeded in copying all test equipment described by Montgomery. FOGY principally dealt with the three-centimeter and 10-centimeter equipment; however, he also made test sets for the region between these two frequencies. He was helped in his work by the following German engineers:

THURLEY - FOGY's best qualified assistant. He is presently located at the RFT Funkwerk Koepenick.

HELLWIG - worked on measuring instruments for crystal rectifiers at NII 160 and is presently doing the same type of work at OSW in East Berlin.

MUNTE - worked on microwave part construction at NII 160 and is presently working at RFT Funkwerk Koepenick.

FLEISCHER (not Tango, Alois) - a poor theoretical engineer, but skilled in practical application.

FOGY did a small amount of work in the one-centimeter region [redacted]

39. [redacted] the history of any work the Soviets or German deportees are doing in the field of guided-missile guidance systems.

In 1945 the Soviets occupied the old Telefunken plant in Berlin. Dr. BUSCHBECK was questioned by the Soviets and shortly thereafter a guided missiles commission was set up. [redacted] The committee was to describe all work previously done on guided missile guidance systems as well as what had been planned by the Germans. The group was originally assigned a working place on Kronprinzen

25X1

[redacted] 25X1

Allee . and consisted of Dr. BUSCHBECK, Dipl. Ing. EITZENBERGER, Dipl. Ing. WILHEIM, plus a few other German engineers. When the Americans came into Berlin, the group was transferred to a building located on the Weissensee, Berlin, where they were forced to live and work in the one building. [redacted] 25X1

The activities of the guidance group was monitored by two Soviet colonels and a 1st Lt. named YULIUS. [redacted] they belonged 25X1 to a special committee, but were later with the ministry that NII 160 belonged to. [redacted] 25X1

The guidance group moved to "Gema" from Weissensee in June 1946. In October 1946 this group was deported to Monino, where it worked until 1950. In the beginning they worked on V-2 guidance as well as that of shorter range missiles. In 1947 FOGY, STEIMEL [redacted] were 25X1 taken to Monino for a one-day meeting with BUSCHBECK. He asked [redacted] questions concerning 25X1 the sensitivity of 10-cm. microwave receivers. He asked Dr. STEIMEL questions about metal ceramic triodes and magnetrons for the 10-cm. region. [redacted] he was 25X1 principally concerned with the 10-cm. region for guidance of missiles. In 1950 some of the best men were taken from Monino to an institute in Moscow. Some of the group remained at Monino and returned to Germany [redacted] Dr. MOSER, 25X1 Dr. NEIDHARDT, ZELETSKY, KLAGES, and KONIG were some that returned. [redacted] Dr. NEIDHARDT 25X1 had worked on butterfly oscillators while at Monino, and some of the other men had designed test sets for the 50-cm. to three-meter region. It is possible that the work of the men that returned to Germany from Fryazino was not connected with the field of missile guidance. [redacted] they collaborated with 25X1 an unknown institute in Moscow, which might be 180.

In 1951 a wife of one of the German engineers employed at NII 160 happened to meet Mrs. BUSCHBECK in a postoffice in Moscow. At this time Mrs. BUSCHBECK was guarded by a Soviet in civilian clothing; however, she managed to say that Dr. BUSCHBECK was obliged to spend four more years in the USSR. She did not speak of the type of work that BUSCHBECK's group was doing.

[redacted] 25X1

40. [redacted] FEUSSNER and KAUFMANN worked with KOTOWSKI on long-range navigation experiments. [redacted] it must have been near Leningrad as it was not in the Moscow area.[10] KOTOWSKI counted on returning to Germany in 1950. In a letter he stated that he had not worked on any long-range navigation system subsequent to that date.

Some type of navigation experiments must have been taking place somewhere between Monino and Shokova.[11] One time [redacted] 25X1 Dr. STILLER and BELIKOV got on the train at a station which was the first stop past Monino and which was approximately five kilometers from Monino. Dr. STILLER was a Soviet who had been interested in long range navigation problems when he was in Berlin in 1946. While in Berlin he had wanted to work on an 80-to 200-meter hyperbolic navigation system; however, propagation problems forced him and his associates to consider the 1000-to 2000-meter wavelength. Before Dr. STILLER left Berlin, it had been decided that the longer frequency would be used in preference to the 80-to 200-meter range. Dr. STILLER is a very competent man; he attended a 1946 navigation conference in London. A series of single masts surrounded by numerous other masts were located at Dr. STILLER's small institute near Monino. [redacted] 25X1

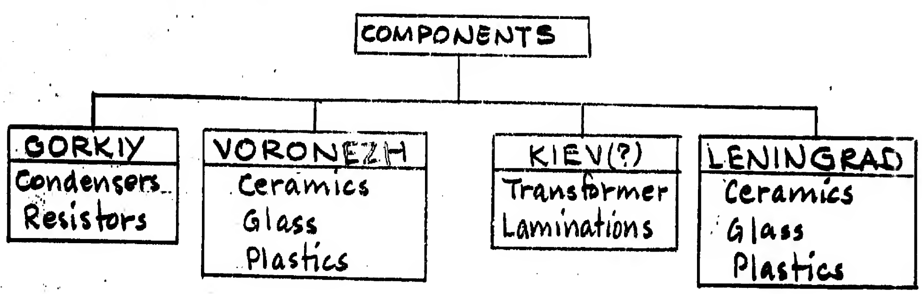
41. [redacted] short-range navigational system [redacted]

A small institute, located in Kuchino, was concerned with the development of the old German Wullenwever direction finder.[12] This institute was under direct military jurisdiction and was actually more like a laboratory than a big institute. There were three Germans, and only a few Soviets, assigned to this place. These men were concerned only with the ultra-high-frequency Wullenwever direction finder and its associated equipment. The equipment they worked on will operate on approximately the same frequency as the old German equipment, and was developed for a ministry whose name was even unknown to the Germans working there.

 [redacted]

The three German engineers employed there were Dr. SCHUETTLOEFFEL, presently working at RFT Funkwerk Koepenick; Dipl. Ing. REHBOCK, presently chief of the OSW ultra-high-frequency test instrument laboratory; and PREISNER, presently employed at RFT Funkwerk Koepenick.

42. [redacted] Ministry of Communications Equipment Industry. [redacted] The following is the organization of the Component Chief Directorate..... [redacted]



The following is a short description of three other institutes or plants in the USSR.

A Baltic German, Dr. RIEHL, came to NII 160 on various occasions as a consultant on luminous materials. He usually dealt with KLUGE during these visits. He was shipped to the USSR in 1946, or possibly before, and was very well paid. [redacted] he works in an institute

 [redacted] 25X1

located near Fryazino which is concerned with electronic tubes and heavy water problems. [redacted] 25X1 [redacted] 25X1 Dr. SCHUETTOEFFEL, en route to NII 160 in 1947, went to this institute by mistake and there happened to meet Dr. RIEHL. Upon getting off the train near the institute, SCHUETTOEFFEL was immediately put into a guarded house by the NKVD. Later he was allowed to talk to Dr. RIEHL, who helped him straighten out the mistake. Dr. RIEHL was closely guarded by the NKVD at all times and was very careful not to tell other Germans what he was doing.

There was another institute located near Mytishchi on the railroad line between Mytishchi and Moscow. This institute was located in a small place called Loss[13] and was concerned with chemical research. Dr. SCHOFF visited some of his university friends there. [redacted] a group 25X1 of chemists were at Loss until 1949 [redacted]

There was a chemical plant, in Shokovo, which furnished NII 160 with its necessary hydrochloric acid. [redacted] 25X1

43. [redacted] the USSR can probably sustain a war, as far as electronics is concerned, by the last of 1954, or first part of 1955. One of the main factors leading to this belief is the fact that the majority of the USSR's effort is presently directed toward this type of production and the remaining industry can be converted to military production in a minimum period of time. Economic considerations receive no consideration, the only purpose being that of obtaining the necessary production. Radar production could probably be expanded four or five times its present capacity within the next two years. [redacted] 25X1 [redacted] the civilian goods began to get scarce once again. This does not mean that they were ever plentiful, by Western standards, but rather that items such as metal cooking utensils, broadcast receivers, and clothing were not as plentiful as they had been in 1949-1950.

 [redacted] 25X1

Expansion of research and development facilities will depend primarily on the training of new engineers. The Soviets have been expending more effort in training engineers than in training other professional personnel. The pay scale for these people was also higher, which means that the best qualified people were entering this type of training. If this condition continues to exist until 1960, the USSR will have more engineers than the rest of the world. The capability of these engineers will probably be less than that of engineers in the other countries, but a great number (small percentage) will be very competent. The Soviet engineer was much more specialized than the German engineer. In fact [redacted] a Soviet "Kandidat" was comparable to a German "Diploma Ingineur". Due to the specialized training which the Soviet engineers receive, they had a great amount of difficulty in associating related problems and devising applications of the various work they completed. 25X1

The problem of poor quality in production was still very acute in the USSR [redacted] in 1946 the emphasis was very definitely on quantity, but later it was common to give bonuses for quality. This does not mean that the percentage of rejections will ever be reduced to a figure comparable to the corresponding rejection figure in Western countries. Quotas absolutely had to be filled, and this necessarily led to a decrease in quality. Another factor working against good quality was the fact that economic requirements were not foremost in a plant's production, as is the case in Western countries. There was a great amount of talk and activity concerning the improvement of quality, but the Soviets were still experiencing a great percentage of rejects. One specific example is that of vacuum tubes where great emphasis was placed on better quality, but rejects still were in the 40 to 50 per cent category. 25X1

44. [redacted] the degree of integration of USSR electronic plants including the dependency of the final assembly plant upon basic component manufacturing plants [redacted]. The USSR did not rely on any satellite country for its entire supply of any one item; however, it placed greater priority on obtaining certain items from these countries. 25X1

[redacted] 25X1

 [redacted] 25X1

Everything had to be completely planned under the system used in the USSR. Therefore, a vacuum tube plant was forced to make screws to hold its production machinery together rather than try to put this small requirement in the yearly plan. If a laboratory or factory needed 500 pieces of a small item, it was sometimes impossible to obtain them; however, if the amount needed was much greater, it could be obtained by applying through an economic committee. Another item which affected the supplying of small amounts was the paper work requirement. The mentality of most of the workers was such that they believed that one liter, or 500 pieces, of an item was not of sufficient importance to warrant the processing of the vast amount of necessary paper work. However, [redacted] 25X1 a gift of a liter of pure alcohol immediately made them change their minds. Many people in the USSR recognized the problem of being able efficiently to obtain items in small quantities; but this problem was far from being solved, as it is inherent in the type of government. This problem was not quite as great at NII 160 in 1951 as it was prior to that time.

The Soviets were trying to decentralize their electronics industry. In fact, [redacted] 25X1 this program was one of the reasons for sending the Germans home. By doing this they help keep foreigners from finding out where the various types of factories are being located. The Germans would have been able to determine the location of these plants by talking to Soviet engineers being sent to the new locations.

45. [redacted] degree of reliance [redacted] the USSR electronics 25X1 industry place on basic components or finished equipment production from East Germany and 25X1 other satellite countries [redacted] 25X1

[redacted] the 6AC7 and 6AG7 tubes received from East Germany had a higher transconductance than did the American tubes. [redacted] the East German metal ceramic tubes were not as good as those made by Novosibirsk subsequent to 1949. In 1946 and 1947 all component parts were of German manufacture. Later in 1947 and 1949 there was a great shortage of all components; however, from 1950 [redacted] there 25X1 was an adequate amount of Soviet-made components.

The Soviets began making some carbon-deposited film resistors in 1948; the majority of their resistors were still of the carbon-pile type.

 [redacted] 25X1

The physical and electrical sizes as well as the color coding were a direct copy of American resistors. Soviet resistors were made in Gorkiy, Kiev, and Voronezh.

[redacted] 25X1

The USSR started making styroflex condensers in late 1950 that were as good as those coming from Germany. It is possible that a small number of German-made condensers were used in Soviet test equipment [redacted] One of the largest Soviet condenser factories was located at Gorkiy and some Siemens condenser men were deported there in 1946. 25X1 25X1

46. [redacted] specifications [redacted] used for the production of electronic components in Soviet and in German-manufactured components designed for the USSR [redacted] 25X1 25X1

Practically all electronic components in the USSR were used by the military. The civilians received a very small amount of equipment of any real value, including the [illegible] replacement parts for their broadcast receivers. Many of the NII 160 engineers had an outside business of selling electronic components they stole from the Institute. Even though the plant guards knew that many people carried stolen property through the gates, they never searched anyone. [redacted] 25X1

Officially the Soviet specifications are known as "East Norms". [redacted] they originated in Hungary, but have now been taken over by the Soviets. [redacted] the norms are classified, appended continually, and are kept in the design departments. At NII 160 they were stored in a "secret" room, and it was not possible for a German engineer to use them. Actually most of the specifications used by the Soviets were American specifications. The American specifications were translated into Russian and were used by the engineers. In some cases the translations were not accurate, in which case the original American specifications were used. [redacted] the Soviet specifications are approximately one year behind those of the United States. 25X1 25X1 25X1

 [redacted] 25X1

It would be possible to learn of Soviet specifications by observing the requirements they place on the East German electronics industry. The specifications would have to be about the same as the Soviet ones; otherwise, the East German components could not be fitted into the Soviet equipment. 25X1

47. [redacted] critical shortages of raw materials [redacted] 25X1

Germanium was in very short supply, and was inadequate to satisfy the needs of NII 160. Many chemical materials were always difficult to obtain, especially items such as plexiglass, oponal, and trallitul (for cable insulation). The Soviets had great difficulty in developing a wax which would work in a crystal detector. They could not find one that was of the necessary hardness. A shortage of good bronzes and special steels existed in the USSR. The Soviets produced great quantities of steel, but they were unable to make good, special types of steel, such as those required for magnets in magnetrons. [redacted] this is one reason that the USSR wants West Germany. 25X1

The USSR shipped a very small amount of raw materials to East Germany. Raw materials were sent only when the Soviets believed that the East German industry would collapse without them. An example of the lack of Soviet concern for East Germany was illustrated by an experience [redacted] at OSW [redacted] 25X1

OSW could not get money to buy the covar from [redacted] so it finally resigned itself to the fact that television transmitter development would be held up. This condition existed for approximately five weeks, after which time the Soviets decided to furnish 20 kilograms of covar as [redacted] originally requested. This was only a loan and had to be paid back with the same type metal. 25X1 25X1

48. [redacted] emphasis being placed on the miniaturization of electronic components [redacted] 25X1

Some miniaturization was being done, but not nearly as much as other countries are doing.

The higher authorities continually put pressure on the engineers to make small items, but the engineers did not respond. This was due to the fact that the engineers thought of the USSR as being extremely large, and did not actually see the necessity of small components, especially when they were more difficult to manufacture.

Some success was achieved in making smaller condensers. In 1952 the USSR was capable of producing a 10 ufd, 450 V, hermetically sealed condenser that was approximately 4" x 4" x 2". They were having great difficulties in making miniature transformers. This was due to the fact that small transformers require good powdered iron and thin laminations; the USSR has neither.

The Soviets began mass-production of miniature tubes in 1951 and plan to use this type wherever it is possible. Approximately three months after a printed circuit article appeared in the American Electronics, KRASILOV talked to RICHTER and [redacted] said that NII 160 might do this work. Later [redacted] an institute in Moscow started doing this about seven months after the American article appeared in the Electronics. 25X1

49. [redacted] probable supply and availability of specialized raw materials [redacted]

Nickel was very abundant; however, pure nickel was always in very short supply [redacted] Vacuum copper was very scarce until 1951, at which time both the quality and quantity was increased. Germanium was always very difficult to obtain. [redacted] practically all of it came from East Germany. Mica was plentiful in smaller sizes; however, the larger pieces were very difficult to obtain, and were of a very poor quality. [redacted] it was very difficult to obtain a good magnetron magnet prior to 1952. The quality was poor at first and probably remained that way. [redacted] 25X1

 [redacted] 25X1

The quality of technical glass was continually presenting difficulties, due to the fact that its composition varied. [redacted] the USSR can mass-produce glass cathode-ray tubes with a diameter greater than 20 cm. They were having great difficulty in making a 16-cm. CRT [redacted] Work was being done in the field of ceramics on high quality ceramics, [redacted] Rare gases were always very difficult to obtain. [redacted] 25X1

50. [redacted] do not think that LIPPSMAN did any work on a 12-13 cm. device, but rather on one with a wavelength of 15-17 cm. It was first planned that 12 to 13 cm. be used, but this wavelength was discarded due to the fact that the available metal ceramic tubes would not operate in this frequency region. [redacted] they went to the higher frequency in 1946 because [redacted] not believe that they would ever change back to 12 cm. because the LD10 would never work on this wavelength. 25X1 25X1

51. [redacted] the development and production of electrometer tubes in the USSR [redacted] 25X1

In 1949 KLUGE questioned [redacted] the type of material that could be used to make sockets for electrometer tubes. [redacted] they were being made at NII 160 [redacted] 25X1

52. [redacted]

The Ministry for Communications Equipment was in charge of NII 160, and officially determined the development assignments. In August of each year, the various departments decided what their development projects should be for the following year. The departmental plans were then sent to the Director of the Institute, and he presented these plans to the Scientific Council for discussion. The Scientific Council of NII 160 was composed of all of the department supervisors, plus ZUZMANOVSKIY, ZHARKOV, two professors from the University of

Moscow, and perhaps one or two other NII 160 consultants. After the Scientific Council discussed the projects, they were returned to the director of the Institute, who forwarded them to the Ministry for approval. By the time the recommended projects actually left the Institute, it was October. The ministry then acted upon the recommendations and sent the next year's development tasks back to the Institute as a directive. Ordinarily the departments received the same assignment they had recommended, but sometimes the ministry added some projects of its own. [redacted] The Klystron Laboratory was [redacted] assigned the task of developing an automatic test set capable of recording standing wave-reflection diagrams, a "Q" test set, and a hollow cavity (wave guide) klystron. [redacted] do not know of any development projects assigned NII 160, except through its ministry. Of course, some of [redacted] scientists worked as consultants for other institutes [redacted] 25X1 25X1 25X1 25X1

53. [redacted] Soviet and non-Soviet periodicals did you generally have access to [redacted]

[redacted] If a desired book, magazine, or paper was not available in the NII 160 library, [redacted] could request it at the Lenin library in Moscow. Dr. RICHTER went to the Lenin library at least one day each week, since NII 160 did not have many publications on chemistry. Institute 160 had such periodicals as Proceedings of the IRE, Electronics, Television News, Physical Review, and Electrical Engineer. Prior to 1951 Electronics arrived regularly, and very soon after publication. In the first part of 1951, this magazine suddenly became unavailable, but by the end of the year it was again obtainable; however, it was always received two or three months after it was published. [redacted] all American magazines were received, but not all of the West German ones were obtained. 25X1 25X1

Some Soviet publications were available, but most of them were not read because they were inaccurate copies of American periodicals which were also available. The Soviet periodical Radio was available, as were the Academy of Science publications. [redacted] Institute 160 published a technical magazine, but it could never be found in the institute's library. 25X1

[redacted]

54. [redacted] the VON ARDENNE group [redacted] it was billeted in a castle located in a very pleasant part of the Caucasus or Crimea. None of the group returned to Germany except one or two that were originally with this group and were later transferred to NII 160. Dr. MIE is one of these men who was transferred to NII 160 from the VON ARDENNE group in either the latter part of 1948 or the first part of 1949. While at NII 160, Dr. MIE did nothing other than a little work on rectifying a problem in the Soviet copies of the American 6X5 rectifier. When the Soviet 6X5 was loaded down, it would arc; and Dr. MIE spent six months working on the problem and accomplished absolutely nothing. He gave a long lecture on the 6X5 arcing problem, but no one in the audience could determine what he wished to say. Dr. MIE is now an old man who realizes that he cannot achieve any great success in his work, and is presently biding his time at the Astro Physicalische Institut in Potsdam, East Germany.

55. [redacted]

During the one year HABANN was at NII 160, he refused to do anything other than read in the library and stay home. He was transferred to an institute (location and name unknown to me) in the Moscow area and then returned to Germany in either 1950 or 1951. [redacted] he lives and works in East Berlin. He absolutely refused to cooperate with the Soviets.

 [redacted] 25X1

56. [redacted] Ing. Gerhard HAUCKE's work.

HAUCKE worked in the ultra-high-frequency tube laboratory of Mrs. KRAKAU, which was under the direction of FEDOSEYEV'S Pulse Magnetron Department. HAUCKE did not do any work of great interest. He was an assistant and did not understand the problems as well as Mrs. KRAKAU did. The laboratory in which HAUCKE worked designed a 300-watt water-cooled triode which was to work in a FM transmitter operating on a two- to three-meter wavelength. They also designed a 350-watt tetrode, and a 1000-watt triode for operation on the same wavelength. HAUCKE is presently employed at the television Center in East Berlin.

57. [redacted]

All the men in the Magnetron Department were transferred in 1950; however, only one of them was returned to Germany prior to 1952 -- a glassblower engineer, LEIPOLD (presently working at Gluehlampenwerk Berlin), who was returned in 1950. GROMADIS did not do any work of great importance. He is presently working at the Television Center in East Berlin.

25X1

58. [redacted] GERLACH, STEIMEL, Willi SIEMS, Dr. KLANG, GRIMM, and Frau MUELLER (the present wife of THURLEY) were all looked upon with distrust, because they had been subjected to close attention by the NKVD.

59. [redacted] the quantity and type of test sets, aging racks, and life-test racks at NII 160 [redacted]

FISHBEIN'S laboratory was responsible for the testing of all klystron tubes. To accomplish the testing of power output, frequency stabilization, and regular emitting characteristics of the klystrons, he had six testing tables with a total testing capacity of 100 klystrons per day. Only two machines were in continual use, giving a testing capacity of 30 to 40 tubes per day. Near the end of the month some of the other testing tables would be used in addition

 [redacted]

to the regular two. Prior to 1949, Institute 160 was responsible for testing all 726 A/B klystrons which were made in Leningrad. After 1949, NII 160 started delivering copies of their klystron-testing racks to Leningrad until a total of four were delivered. In 1951, NII 160 started manufacturing miniature klystrons that were scaled-down versions of the octal-based 2K45 American klystron. This production amounted to approximately 10 tubes per day in the beginning of 1945. At this time they were also manufacturing normal size copies of the American 2K45 tubes. The 723 A/B klystrons made in Leningrad had a very short lifetime of 60 to 100 hours. The 726 A/B tubes had a life expectancy of 300 hours in 1949, but were somewhat better in 1952. All of these klystrons were tested in FISHBEIN'S laboratory. 25X1

Institute 160 had two test racks designed to test the electrical characteristics of silicon detectors, two for testing their conversion losses, two for checking their noise ratios, one for making spike tests, and one for testing video detectors. It was normal procedure for the crystal rectifiers to be assembled, given a preliminary characteristic check, and then adjusted (by varying tension of the tungsten spring on the silicon block) for conversion loss; after this the screw head was sealed with lacquer, given a noise-ratio test, a spike test, and finally another conversion test. After these tests were made, a certain percentage of the rectifiers were given a drop test, humidity check, and were then completely rechecked. [redacted] 25X1

[redacted] The silicon detectors made in the USSR were somewhat different from those made in America. The Soviets evaporated silicon on carbon blocks, rather than make a solid block of silicon. Some trouble was experienced with the silicon layer wearing away, but most of the rectifiers were usable as long as the furnaces were kept clean. When the furnaces became dirty, it was sometimes necessary to discard the entire batch rather than try to sort out a few good ones. Each furnace was capable of processing 200 rectifiers simultaneously, and usually required five to six hours to process each batch. [redacted] 25X1

SECRET

 [redacted] 25X1

All general type vacuum tubes made at NII 160 were tested in the Spot Test Laboratory, which was part of the Radio Technique Department of DURASOV. This laboratory was under the guidance of AVNERS, a Soviet, and had approximately 47 Soviet and German engineers and technicians assigned to it. There were ten testing tables designed to test the electrical characteristics of each tube. Each rack could accommodate one or two tubes. There were also two testing tables designed to test second and third harmonic distortion present in the tubes. Immediately next door to the room which housed the above testing tables was a 5 x 15 m. room which housed eight or ten aging racks. Each rack had provisions for plugging tubes in on one side of a rack which was three meters wide and one and one-half meters high. The tube sockets were located as close to each other as the tube envelopes would allow. [redacted]

60. [redacted] USSR organizations that manufacture vacuum tube producing machinery and testing equipment.

The OKBM of NII 160 developed and made models of vacuum tube manufacturing machinery, but [redacted] do not believe it was responsible for its mass production. The OKBM was greatly expanded [redacted] at NII 160 and in 1950 it was finally moved into a new building. [redacted] 300 people worked for OKBM after it moved into the new building. There were rumors about the OKBM being transferred to Moscow in 1949 and then again in 1951. The OKBM was directly under the jurisdiction of the director of the Institute. 25X1

25X1

The control, screen, and suppressor grids used at NII 160 were also manufactured there. This is also true of the cathodes, which always caused a great deal of trouble.

61. [redacted] PEDERZANI's work at NII 160 [redacted]

PEDERZANI developed a test rack for simulating noise in vacuum tubes. He also designed one for testing transmitter tubes similar to the 6L6, as well as a test set designed to measure the input resistance of a tube. [redacted]

[redacted] 25X1

25X1

62. [redacted] 25X1

25X1

Admiral BERG and SHOKIN visited NII 160 in 1947 immediately after STEIMEL [redacted] had complained about being taken to the USSR [redacted] Admiral BERG said he would intervene with higher authorities [redacted] but SHOKIN made no promises. In the beginning of 1948, NII 160 manufactured and shipped some 10-cm. crystal detectors to a radar institute. A few weeks later three engineers came from the radar institute and complained about the detectors burning out after only 400 hours of use. The engineers told [redacted] that the American detectors lasted longer, which meant that NII 160 was definitely delivering inferior detectors. [redacted] the trouble was probably in the radar set, and that it should be checked. About three weeks later the engineers returned again and asked what could be wrong with the equipment which would cause it to keep blowing fuses.

25X1 25X1 25X1 25X1 25X1

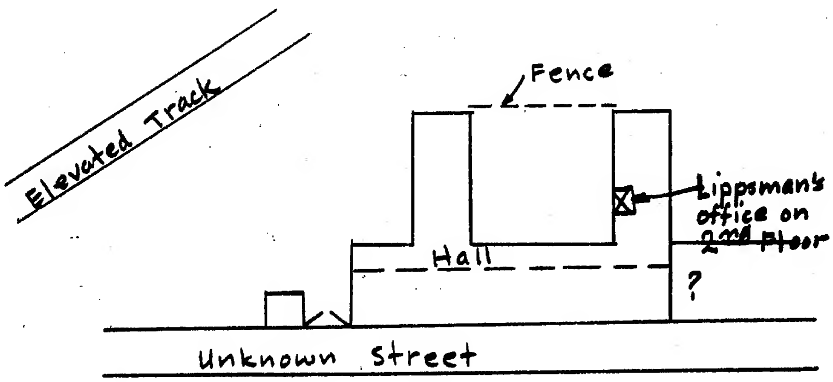
63. [redacted]

64. [redacted] Soviet plants engaged in manufacturing telephone or telegraph equipment [redacted]

 [redacted] 25X1

[redacted] All special communication devices were developed and manufactured by plants which belong to the Post Ministry. [redacted] 25X1

65. Institute 180 was under the jurisdiction of the Ministry for Communications as was NII 160. It was located in Moscow and was known to be concerned with the development of pulse-phase modulation, decimeter communications equipment. From the size of the building [redacted] 25X1 NII 180 was concerned with development other than that listed above [redacted] 25X1



[redacted] 25X1

[redacted] 25X1

67. [redacted]

68. [redacted] LIPPSMAN's office [redacted] His office was about six meters long, four meters wide, and was located on the second floor of the Institute. It contained regular office equipment plus a conference table and a metal rack which held the chassis of the low-frequency part of the decimeter equipment developed by LIPPSMAN's group. [redacted] 25X1
[redacted] the impulse laboratory [redacted] was located immediately across the hall from LIPPSMAN's office. It occupied approximately 90 square meters of floor space, and was staffed by nine Soviet engineers and technicians. This laboratory was responsible for developing all of the pulse forming circuits necessary for the decimeter equipment. The equipment in this laboratory consisted of German and American pulse generators, tone signal generators, oscilloscopes, and Soviet direct copies of Dumont oscilloscopes. The second NII 180 laboratory [redacted] 25X1
[redacted] was known as the intermediate amplifier laboratory. 25X1
A total of six Soviet engineers and technicians worked in this laboratory, which had 64 square meters of floor space. Intermediate amplifiers for 30 megacycles and 40 megacycles were developed in this laboratory.

69. [redacted] 25X1

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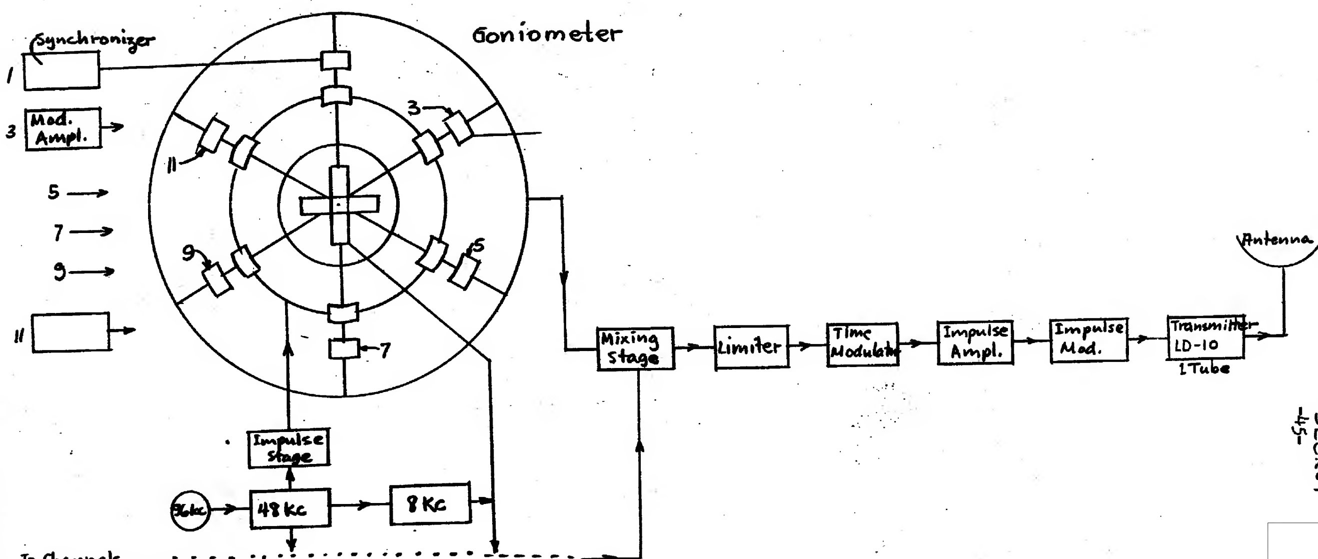
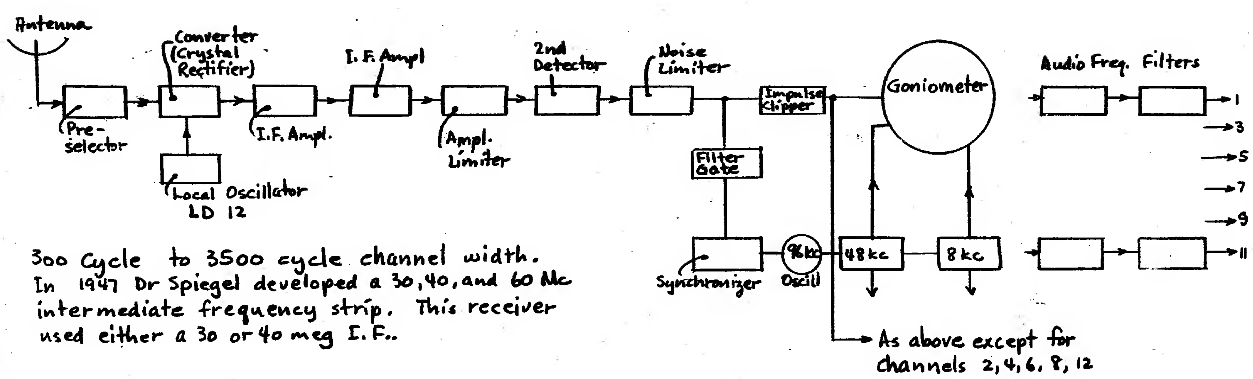


12 CHANNEL TRANSMITTER
(Uses 3 Meter Parabolic Antenna)
(Uses 1 Meter Parabolic Antenna - Portable)

SECRET

25X1

SECRET



300 Cycle to 3500 cycle channel width.
In 1947 Dr Spiegel developed a 30, 40, and 60 Mc intermediate frequency strip. This receiver used either a 30 or 40 meg I.F..

DECIMETER RECEIVER for 15-17 cm

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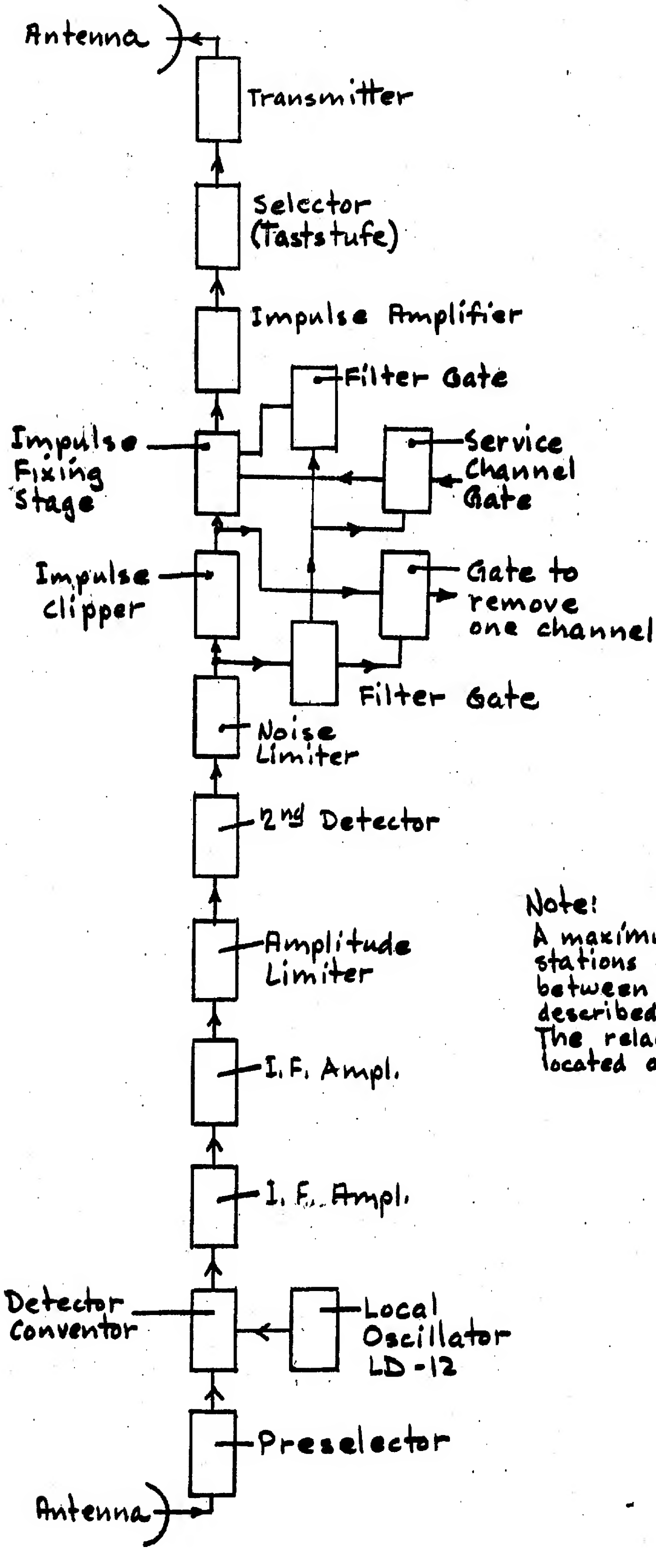
25X1

25X1



Note:
A maximum of 20 of these stations are to be incorporated between terminal stations described on pages 45 and 46. The relay stations are to be located approx. 80 KM apart.

DECIMETER RELAY STATION

Organization Chart - INSTITUTE 160

FRYAZINO - USSR (as of March 1952)

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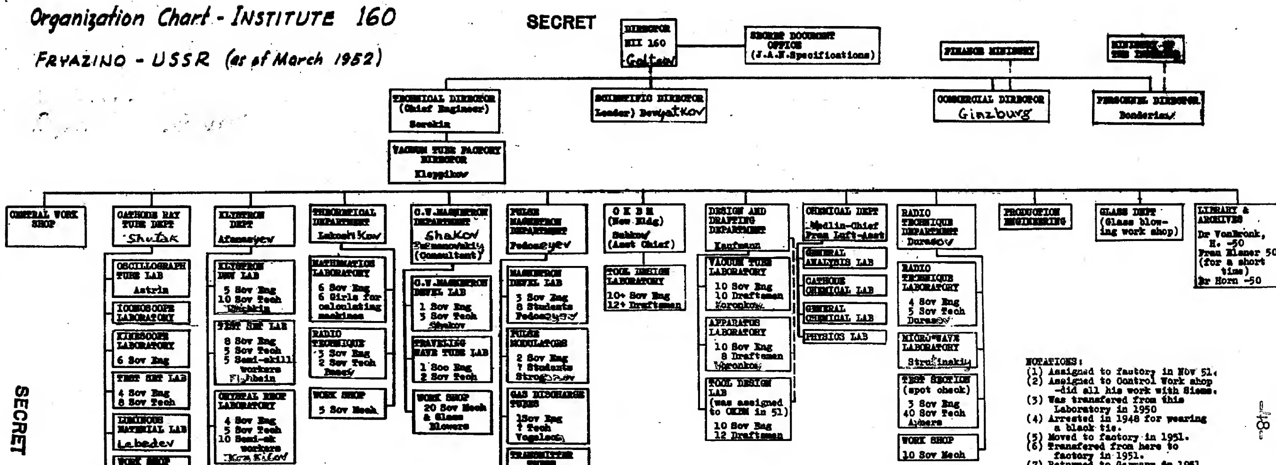

NOTE; Listed below are names of German scientists and technicians who were assigned to various NII 160 departments. The year shown by each man's name denotes the last date he was assigned to the department, and in the majority of instances is the year he returned to Germany.

NOTATIONS:
(1) Assigned to factory in Nov 51.
(2) Assigned to Control Work shop -did all his work with Siems.
(3) Was transfered from this Laboratory in 1950
(4) Arrested in 1948 for wearing a black tie.
(5) Moved to factory in 1951.
(6) Transfered from here to factory in 1951.
(7) Returned to Germany in 1951 -left this section in 1950.
(8) Hans Siems transfered to Spot Test in 1950.
(9) Here until 1950, then to Glass Plant.
(10) Returned to Germany in 1950.

Christians -50
Joehle, Wilhelm (Died in USSR)
Kuhlhanek -52
Lens -50
Morgenroth -52
Musche, Franz -50
Peters -52
Richard, Max -52
Riedel -50
Sasse (Sr) -50
Sasse, Erwin Jr -50
Schaaf, Heinrich -52
Schroeder -52
Stolle, Helmut (did not work Pulse Mag Dept)
Treiber, Karl-50

Bahr -52
Dirbach, Walter -50
Fiedler, Werner-50
Gutzke, Walter -50
Haas
Klang, Helmut -52
Klaus, Werner -52
Lowing -52
Michels, Fritz-50 (EMG-101)
Mueller, Ilse Mrs -52
Richter, Max -52
Rohwedder -52*
Rottgart, Juergen -50 (EMG-120)
Seuf -52
* not in Design Department

Ewald, Walter-50
Genswindt -51(1)
Gerlach, Horst-52
Gross -52 (2)
Hellwig -52
Kohlberg -52
Nie, Kurt -52
Milde -51 (1)
Schloemilch, J. -51 (5)
Siems, Willi-52
Spiegel, Eitel -52 (3) Source of this Report
Stabe -50
Troppler, Hans-50
Wehner -52
Wetzig -50
Wiemer, Helmut -48(4)
Zimmermann, R. -51

Dobrack, G-50
Hagen, G -50
Gerhardt, E-52
Frey, G -50
Federmann, F-50
Probst, H -52
Rosenstein, H. -52
Schuster -52
Steinel, K-52

Hagel -52
Foerster-50
Groundis, H-50
Leipold, F -50
Peters -52

Bodendorf-50
Boettner, J, -50 (6)
Fischer, R-52
Hancke (7)
Hanke -50(6)
Siems, H (8)
Slunsek -50
Sperling-50

Bielefeld, R. -50
Brakke -52
Bolka, F-50
Dohnal, Jr-50
Fischer -50
Fischer, H-52
Gierszewski, H. -50
Heime -52
Hoenen, P -50
Jonathat, P. -52
Knefert, R-52
Koenner -50
Kostrum, R-50
Maack -50
Palme -52
Schneider-50
Schmitt, E -50

Ballenthin, K-50
Bohne -52
Delp, M -52
Piebelkorn -50
Fischer -50
Fleischer, A-50
Froemmel, F-50
Haupt, G -50
Hoppe -50
John -50
Karwatzki -50
Koenner -50
Koeppe, G -52
Malchow, W-50
Otto, E -50
Reinecke, H-52
Reschke, H-52
Schmidt -50
Schoenfelder Sr. -52
Sentz, P -52
Sprotte, P-50
Tembert, G-50
Thomermann, B-50
Wende, H -50
Zander, M -52

Anhalt, W-52
Brueck -50(9)
Feigl, E -50
Prang, W -52
Richter, K -52
Schaaf, E -52
Stern -50

Bickel -50(10)
Elsner -50(10)
Fleischner, H. -50 (10)
Fogy (48 arrested)
Grimm, W -52
Hagen, E -50(10)
Junker, A-50(10)
Kemper -50(10)
Loewe -50(10)
Mattern-50(10)
Munte, H (9)
Federmann-50(10)
Raschke, A-50(10)
Schultze -52
Schulze, B-52
Siems, H -52
Turley, A-50(10)
Hagenhagen, F. -50 (10)

Boettinger, H-50

Riedel, W (arrested in 48)
Wagner, F -50

Arndt, K -50
Buettner, J -52
Genswindt -52
Hanke -52
Hoffmann, H -50
Leuschner -50
Marschner -50
Rotenberg, P-52
Rottgart, J -52
Sperling -50

SECRET

SECRET

SECRET

-48-

25X1

 [redacted] 25X1

1. [redacted] Comment. Not located. [redacted] places it near Fryazino. 25X1

2. [redacted] Comment. Chief Directorate for Vacuum Technique, or Chief Directorate for Vacuum Tubes.

3. [redacted] Comment. Has also been reported as VOGI or VOGY.

4. Comment. Ministry for Communications Equipment Industry.

5. [redacted] Comment. Probably Chief Directorate for Vacuum Technique or Chief Directorate for Vacuum Tubes [redacted] 25X1

6. [redacted] Comment. Nomenclature is a mixture of RCA and two series of Russian designations. [redacted]

7. [redacted] Comment. Ministry of Communications. [redacted] 25X1 [redacted] the Ministry of Communications, as well as the Ministry for Communications Equipment Industry, had laboratories for the development of communications equipment.

8. [redacted] Comment. Has also been reported as Rosenstein. 25X1

9. [redacted] Comment. [redacted] places Dr. Lippsman at Institute 20. 25X1

10. [redacted] Comment. Possibly Lossino Petrovsk. [redacted]

11. [redacted] Comment. Not identified. Possibly Shchelkovo.

12. [redacted] Comment. [redacted] "Wollenweber" and "Wullenwever" are interchangeable terms. 25X1

13. [redacted] Comment. Not identified. Possibly Lossino Petrovsk.

14. [redacted]

15. [redacted] Comment. Has also been identified as Dr. Heinz Gromadies. 25X1

16. [redacted] Comment. [redacted] Erwin and Horst [redacted] Gerlach are the same. 25X1